angeführten Abgaben benutzt, bestimmt man den Wert des Kriteriums Kks.für Böden mit unterschiedlicher Feuchtigkeit, bei der auf den Rohrstahlmustern sich der Wasserstoff freizusetzen beginnt (T sei 250 C gleich). Die Ergebnisse sind in der Tabelle angeführt.

Die ermittelten Ergebnisse zeigen, dass die Freisetzung von Wasserstoff beginnt, wenn das Verhältnis der J_{ks}/J_{gr} gleich 3,7...4,7 je nach der Art und der Feuchtigkeit des Bodens ist. Eine deutliche Freisetzung von Wasserstoff beginnt, wenn dieses Verhältnis 5...7 erreicht [7]. Dabei wird die «klassische» Korrosion zuverlässig durch Kathodenschutz unterdrückt, wenn $j_{ks}./j_{gr}$ =3...5 ist. Ausgehend davon ist es notwendig für die Kontrolle der Bildung der Spannungsrisskorrosion des Rohrstahls, die Bedeutung des Kriteriums K_{ks}im Bereich der Werte 3...4. zu unterstützen. Für die Messung der j_{ks}und j_{gr}urde der Hardware-Software-Komplex «Magistrale» entwickelt, der unter Straßenverhältnissen die Geschwindigkeit der restlichen Korrosion und den Grad der Rissbildung an der Rohrwand bei verschiedenen Potentialen des Kathodenschutzes der unterirdischen Stahlrohrleitungen quantitativ bestimmen lässt. [4].

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INCREASING THE EFFICIENCY OF TRADE GASOLINE BLENDING PROCESS USING COMPUTER MODELING SYSTEM

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Under modern competitive economy conditions, every refinery set the provision of domestic and foreign market with high-quality gasoline as main goal and, in the same time, reducing costs for its production. So the great attention is paid to the blending process, production of high-quality gasolines by mixing of straight-run oil fractions with secondary refining processes components and special additives. During this process, the qualitative and quantitative characteristics of gasoline are determined.

The blending process is extremely difficult for optimization due to factors [1]:

- the large number of components;
- deviations from additivity of physical and chemical properties of components in the mixture;
- difficulties connected with mathematical models developing which could adequately describe the process in a wide range of components properties variations.
- permanent changes in the component composition of feedstock.

The department of Chemical Technology of Fuel and Chemical cybernetics of National Research Tomsk Polytechnic University proposed a model for blending process calculating. This model describes blending from the position of non-additive nature of feedstock physic-chemical properties, caused by mutual influences of hydrocarbons and special anti-knock additives atoms and molecules. On the basis of this theory the computer modeling system «Compounding» for calculation of gasoline blending process was developed. Its main purpose is to calculate octane numbers of trade gasolines produced with the blending method [2].

The input data for the calculations in this modeling system is the chromatography data of streams involved in the blending process. Due to lack of unified standardized methodology of results presentation experimental chromatography data from refineries is significantly different. This problem was solved by implementation the module of automatic chromatography data systematization into the «Compounding» system. The base of systematizing is the set of 110 hydrocarbons shown in Table 1.

On the basis of the created set, a computer module of automatic chromatography data systematization is realized. The main program unit is developed in Borland «Delphi 7» workspace, which provides an opportunity to develop a user-friendly interface in a short-time period, without losing its functionality.

The results of calculation are saved into the «.sfc» extension files. These files are the input data for computer modeling system «Compounding», where octane numbers of separate streams or their mixtures with the additives are calculated.

Table 1

The content of automatic chromatography data systematization module

Group name	Number of components
Normal paraffins	10
Isoparaffins	39
Napthenes	32
Aromatics	15
Olefins	14
TOTAL	**110**

As the adequateness test for developed set of components, octane numbers of streams with the known detonation characteristics were calculated applying created set of components. Results are given in Table 2.

Table 2

Comparison of calculated octane numbers with the experimental data

Stream	RON_{calc}	RON_{exp}	Δ
Alkylate	93.3	93.3	0.03
Reformate №1	94	94.5	0.53
Reformate №2	95.4	96	0.6
Catalytic cracking gasoline	85	86	1
Gas fractionation unit gasoline	83.2	82.8	0.38
KAS unit gasoline	88.2	87.3	0.88

$\Delta = | RON_{exp} - RON_{calc} |$

Analysis of results, given in the table 2 reveals that the proposed method allows octane numbers calculating with an absolute error of no more than 1 point. This is comparable with the error of experimental methods for this parameter determination. So, this set of components created for module of automatic chromatography data systematization could be applied for calculation of real gasoline streams octane number.

Using the modeling system, in conjunction with the developed module of automatic chromatography data systematization, blending recipes for gasolines Premium-95 and Super-98, corresponding to modern Euro-3, Euro-4 and Euro-5 requirements for gasoline quality, were created (Table 3).

Table 3

The recipes of gasolines brands Premium-95 and Super-98

Streams	Stream content, % wt.			
	Premium-95			Super-98
	Euro-3	Euro-4	Euro-5	Euro-5
Products of moving bed catalytic reforming process	28	28	27	29
Alkylate	20	19	16	25
Natural gas gasoline	5	4	5	–
Catalytic cracking gasoline №1	–	25	–	–
Catalytic cracking gasoline №2	25	–	28	25
Isomerizate	22	20	20	15
MTBE	–	4	4	6
Gasoline characteristics				
RON	**95.9**	**95.2**	**95.9**	**98.2**
Benzene content, % wt.	1	0.96	0.99	1.01
Aromatics content, % wt.	29.22	29.07	29.16	29.84
Olefins content, % wt.	6.01	5.04	6.6	4.95

The main criteria for blending recipes were requirements for gasoline quality, components costs and their presence on the refinery. Under modern conditions, the most expensive components are products of alkylation and isomerization units; otherwise they do not contain aromatics and olefins. It makes them the best feedstock for the blending process.

Analyzing the recipe of gasoline brand Premium-95, corresponding to modern Euro-5 requirements for gasoline quality, it was found that it does not seem possible to produce this brand of gasoline without application of MTBE, and its minimum content is 6 % wt.

It could be concluded that the module of automatic chromatography data systematization in conjunction with the program «Compounding» allows precise counting of streams hydrocarbon composition and detonation characteristics of gasoline. Also it helps to correspond the changes of feedstock composition, to vary blending recipes of trade gasoline and to recommend optimal involvement of different-composited feedstock into the blending process.

Precision of the developed recipes provides economy of expensive components, and allows getting essential economic benefit for the refineries by reducing the quality for trade products.

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PARAFFIN-BASE OIL TRANSPORTATION USING POUR-POINT DEPRESSANTS

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Nowadays the extraction of high-paraffin crude oil with the high content of paraffinic hydrocarbons increases. While being extracted, transported and stored, deterioration of the rheological properties of high-paraffin crude oil is observed. This leads to increase of equipment deterioration, additional material expenses and problems with environmental conditions. Down-the-hole treatment is promising method of asphalt–resin–paraffin (ARP) sediments control. Usage of pour-point depressants prevents wax depositions and also improves the rheological properties of crude oil. Efficiency determination of pour-point depressants is based on high-wax oil from Maiskoye field.

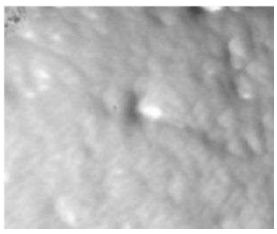

Fig. 1 Original oil sample

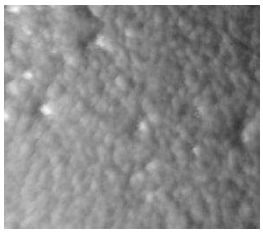

Fig. 2 Oil sample with "DMN" depressant

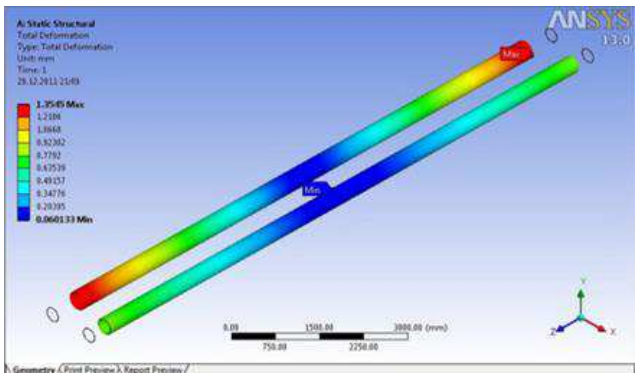

Fig. 3 Deformation distribution of pipeline under original and modified pressure

By analyzing the pictures of residual oil structures we can see that oil sample with pour-point depressant "DMN" has more dispersed composition(Fig.1. and Fig.2.). Measurements of the rheological properties were made by rotational viscosimeter "BROOKFIELD LVDV-III Ultra". To evaluate the influence of depressant on stressed-deformed state of pipeline we used modelling in engineering simulation software ANSYS, that was based on the data gained by "Neftehimtehnologii" company during testing of pour-point depressant "DMN-2005" in pipeline section of Severo-